Summer Assignment Name:_____
Algebra 2

The purpose of this packet is to make sure that you have the mathematical skills that you will need to succeed in Algebra 2. This packet will be due on the first day of class. It will be the first grade of your first quarter of Algebra 2!

Discussing and working the problems with your peers is encouraged, but copying someone's answers is **NOT**! There is a difference and at this point in your academic career you will be expected to know that. To receive credit all work must be shown, and any work done on additional paper must be turned in with the assignment. There is a reference sheet on the first two pages of this packet that you can use to help you remember some important things to remember for the three topics in this packet.

If you are super stuck and need some help, feel free to email me. I'll get back to you as soon as possible (please remember: teachers do not check their email consistently over the summer).

Suggested Timeline for Completion:

- ☐ Weeks 1-2: Linear Equations, Inequalities & Systems
- ☐ Weeks 3-4: Polynomials, Factoring & Exponents
- ☐ Weeks 5-6: Functions & Graphing Foundations

See you in September!

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Reference Sheet

Topics	Key Reminders
Linear Equations, Inequalities & Systems	The Golden Rule: Whatever you do to one side of an equation, you **must** do to the other side to keep it balanced. System Outcomes: If your variables cancel out and you get a true statement (like 5 = 5), there are **infinitely many solutions** (the lines are identical - If they cancel out and you get a false statement (like 0 = 12), there is no solution (the lines are parallel). The Inequality Flip: When multiplying or dividing both sides of an inequality by a **negative number**, you must **FLIP** the inequality sign. Distributive Negatives: When distributing a negative number across parentheses, don't forget to change the sign of **every** term inside.
Polynomials, Factoring & Exponents	Order of Operations for Factoring: Always look for a GCF (Greatest Common Factor) first before trying any other method. It makes the numbers much smaller and easier to manage. The "X" Marks the Spot: When factoring a standard trinomial $x^2 + bx + c$, you are looking for two numbers that **multiply** to c and **add up** to b. Negative Exponents: Think of a negative exponent as a "ticket" to cross the fraction bar. If a base has a negative exponent in the numerator, move it to the denominator to make it positive (and vice versa). Exponent Rules vs. Normal Numbers: When simplifying expressions like $(3x^4)^2$, remember that the coefficient 3 follows regular math rules ($3^2 = 9$), while the exponent follows power-to-a-power multiplication rules ($4 \times 2 = 8$). The result is $9x^8$.

Functions & Graphing Foundations	Function Notation: $f(x)$ is just fancy name for y. It reads as "the output of the function when the input is x." The Vertical Line Test: If you look at a graph, a vertical line should never hit it more than once. If it hits twice, the relation is not a function. Parallel vs. Perpendicular Slopes: **Parallel lines** have the exact same slope. **Perpendicular lines** have slopes that are opposite reciprocals (flip the fraction, flip the sign; e.g. $\frac{2}{3}$ becomes $-\frac{3}{2}$. Slope Formula Disconnect: The slope formula is $\frac{change\ in\ y}{change\ in\ x}$. A very common mistake is accidentally putting the x-values on top. Formula Reminder: $m = \frac{y_2 - y_1}{x_2 - x_2}$

Linear Equations, Inequalities & Systems

1. Solve for x:
   $5x - 12 = 18$

2. Solve for y:
   $3(2y + 4) = 24$

3. Solve for m:
   $7m - 4 = 3m + 16$

4. Solve and graph the inequality on a number line:
   $-2x + 5 < 11$

5. Solve the system of equations by substitution:
   $y = 3x - 1$
   $2x + y = 9$

6. Solve the system of equations by elimination:
   $x + y = 6$
   $x - y = 2$

7. Find the x- and y-intercepts of the line:
   $3x - 4y = 12$

8. Solve for x:
   $\frac{1}{2}(4x - 8) = 3x + 5$

9. Solve for n:
   $\frac{2n-3}{5} = \frac{n+2}{3}$

10. Solve the compound inequality and write the solution in interval notation:
    $-3 \leq 2x + 1 < 7$

11. Solve the system using any algebraic method:
    $4x + 3y = 1$
    $2x - 5y = 20$

12. Solve the system using any algebraic method:
    $5x - 2y = 10$
    $3x + 4y = -7$

13. Rearrange the literal equation to solve explicitly for y:
    $3x - 7y = 21$

14. An electronics store sells HDMI cables for $8 each and power strips for $12 each. A tech department buys a total of 25 items and spends $236. Set up and solve a system of equations to find how many of each item they bought.

15. Solve for x:
    $2(x - 3) - 4(2x + 1) = 3(x + 5) - 9$

Polynomials, Factoring & Exponents

16. Simplify using exponent laws:

$(2x^3y^2)(5x^4y^5)$

17. Simplify, leaving your answer with positive exponents only:

$\frac{15a^6b^2}{3a^2b^7}$

18. Simplify:

$(4x^2 - 3x + 5) + (2x^2 + 7x - 8)$

19. Distribute and simplify:

$3x^2(2x - 5)$

20. Multiply the binomials:

$(x + 4)(x - 9)$

21. Factor out the Greatest Common Factor (GCF) completely:

$6x^3 - 18x^2 + 24x$

22. Factor the trinomial:

$x^2 - 9x + 20$

23. Simplify using exponent laws:

$(-3m^3n^{-2})^3$

24. Simplify the expression so no negative exponents remain:

$\left(\frac{2x^{-2}y^3}{z^4}\right)^{-2}$

25. Subtract the polynomials:

$(7x^2 - 2x + 3) - (3x^2 - 5x - 4)$

26. Expand the perfect square trinomial:

$(3x - 5)^2$

27. Factor completely using the difference of two squares:

$49x^2 - 64$

28. Factor the trinomial:

$x^2 + 2x - 24$

29. Factor the trinomial:

$2x^2 + 11x + 12$

30. Factor the trinomial:

$3x^2 - 14x + 8$

Functions & Graphing Foundations

31. If $f(x) = -3x + 8$, find $f(4)$ and $f(-2)$.

32. Evaluate the function $g(x) = 2x^2 - 5$ for $g(-3)$.

33. Find the slope of the line passing through the points (2, 5) and (6, 13).

34. Identify the slope and y-intercept of the line given by the equation:
$y = -\frac{2}{5}x + 7$

35. Write the equation of a line in slope-intercept form with a slope of 3 and a y-intercept of -4.

36. Determine whether the relation given by the set of ordered pairs is a function, and state why:
$\{(1,\ 2),\ (3,\ 4),\ (5,\ 4),\ (1,\ 5)\}$

37. Look at the linear equation $y\ =\ 4$. Is this a horizontal or vertical line? What is its slope?

38. Given $h(x)\ = \frac{12}{x-3}$, find $h(7)$ and explain why $h(3)$ is undefined.

39. Write the equation of the line passing through (-1, 6) and (3, -2) in slope-intercept form.

40. Convert the following equation from point-slope form into standard form ($Ax\ +\ By\ =\ C$):
$y\ -\ 4\ =-\ 2(x\ +\ 3)$

41. Find the domain and range of the function shown by the set of coordinates:
$\{(-\ 2,\ 3),\ (0,\ 5),\ (2,\ 7),\ (4,\ 9)\}$

42. State the domain of the function $f(x) = \sqrt{x - 5}$ using inequality notation.

43. Find the x-intercept and y-intercept of the line $5x - 2y = 20$, then use them to sketch the graph.

44. Write the equation of a line that passes through the point (4, -1) and is parallel to the line $y = 3x + 7$.

45. If $f(x) = 3x - 4$, find and completely simplify the expression for $f(2a + 3)$.